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ABSTRACT

A metaphor and ongoing debate of the information age is that the mind is a computer or that, conversely, the computer has a mind. Since the debate is conducted using anthropomorphic metaphors such as "intelligent," "memory," and "friendly" (terms from humanity), the language itself pressures the discussion towards the conclusion that computers will surpass humans. In discussing the potentials of future computers, people are really just exploring the implications of their metaphors. For example, they say that the "intelligent" computer will someday "understand" natural language. The use of metaphor prompts people to make exaggerated claims for the computers, and these claims are taken seriously. Computers are ideal or even preferable for tasks which do not require insight or intuition--tasks that are performed by following a set of procedures, although no computer can match the range of awareness of the human mind. Teachers and students need to be aware of the implications of the metaphorical language which is used to describe computers, and the consequent effect of this language on their philosophy. It would be useful to discuss the capabilities of computers in a more appropriate technical language. (PRA)

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The Metaphor of the Mind-as-Computer: Some Considerations for Teachers

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One of the central metaphors of the information age is that the mind is a computer. This also gets read the other way, the computer has a mind. There is a lively debate in our culture over the validity of this metaphor.

Is our mind a computer? Is a computer like a human mind? Will a computer ever be able to match a human mind at such-and-such a task? Will the human mind ever be able to match the computer? And so on...we've all heard this debate in one form or another I am sure.

Events have not given us any definitive answers to the big issues in the debate. There are now computers which can play master-level chess (although they have been programmed by humans), but it seems that many commonsense tasks performed by humans are beyond computer capabilities even today--understanding natural language, for example, or picking out significant objects in a room. We are caught in a welter of claims and counterclaims about what computers can do, what they will be able to do "soon", and what they might be able to do if only we can design one cleverly enough.

We are all caught up in the implications of this debate as we watch computers enter more and more areas of our lives, and as we see computers taking jobs away from people. Will computers ever be able to teach students better than humans? Will a computer program someday teach composition better than we can?

I may as well make my personal position clear at the outset--I do not think the human mind is a computer, nor do I think that any electronic computer can match the range of awareness that a human mind possesses. On the other hand, for certain types of tasks, I think

computers are far preferable to human minds. Computers are good for those tasks which can be performed by following sets of procedures, and which don't require insight or intuition. Where intuition, empathy, or "hunches" are required, however, give the human mind every time.

I don't want to go over all the ramifications of this debate or try to settle it here, because obviously I can't. What I would like to do is give you my take on this debate with respect to one key area: the language the debate is conducted in, which is largely metaphorical language. I am hopeful that teachers will find this perspective useful in thinking about the debate themselves and in getting students to stretch their minds over some of these issues. Students, of course, will have to live in even more of a computerized world than we do. I think we are doing them a favor by making them more aware of the implications of their language when they discuss computers.

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We use a set a of anthropomorphic metaphors to describe computers: the computer is a "brain," it is "intelligent," it has "memory", it has its own "languages," it can "read" "words" and manipulate "symbols." We can hold a "conversation" with it. The machine can be user-"friendly." All these terms are in the dictionary, and it is important to point out that they are metaphorical, because we tend to take them literally. Most of us have no other languages to describe what a computer is, and what it does.

My point is, when we take this metaphorical set of terms literally, and use it to describe what computers do, then the language itself will become a factor in our debate about the differences between human minds and computers. Our anthropomorphic metaphors will pressure our thought toward the conclusion that our minds are very much like computers, that computers will be able to do everything we can do, and so on. Our philosophical conclusions will be contained in our choice of terms. This is particularly true when we start discussing what computers can do in the future.

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Let me underscore the metaphorical nature of these terms by giving a brief example comparing human memory with computer "memory".

The memory of a human being is very different from the "memory" of a computer. A computer just shuttles data configurations off to a set of circuits, stores them there, and brings them back to central processing when directed to do so. Human memory, on the other hand, is a complex process which involves abstracting out key elements of the memory, accommodating the new information to already-existing structures in the brain, and assimilating the new memories into the working memory-structures. Human memory is distributed widely through the brain, not just narrowly located. When human memory is recalled, it involves a process of reconstruction from the abstracted cues which are remembered.

So even though the metaphor of a computer "memory" is beautiful and clearly describes what a computer does, when we examine it closely, there are many significant differences between computer "memory" and human memory. I could make similar points about all of the other above metaphors.

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Look what happens when we start describing the potentials of computers of the future. Look how our language takes over and guides our thought. Since there is no actual hardware to test, no physical limitations of actual machinery to put bounds on our speculations, the only way we can explore the potentials of the new technology is through exploring the implications of the metaphors we use to describe it. This is when the metaphorical terms become most powerful and most insidious.

Now, we have used a field of metaphorical terms from human beings to describe computer functions. And we are hearing claims that future computers will be able to do everything humans can do, and more. Since we conduct the discussion using metaphorical terms from humanity, then the very language we use will pressure the discussion toward the conclusion that computers will, in fact, surpass humans. In effect, our conclusions are implicit in our choice of terms. We think we are discussing the potentials of future computers, when actually we are really just exploring the implications of our metaphors.

This influence of language is, I believe, at the heart of the process by which exaggerated claims get made for computers, and the

claims get taken seriously. This is why it is so puzzling when these electrical contraptions do not, in fact, live up to their expectations.

Let me give an example. Let's say we are discussing the question whether or not computers can ever understand natural language without human assistance. I will phrase the argument in two sets of terms: first, using the anthropomorphized language we normally use to describe computers, and second, the same argument stated in a more neutral, technological language. Note how the selection of terms pressures the argument toward certain conclusions.

First, the anthropomorphic terms. Well, you know, the computer's "memory" is going to be expanded, and we are developing more complex computer "languages" all the time. New programs will allow even faster manipulation of "symbols". When this new capacity is joined up with "voice-recognition" features, you will be able to talk to the computer, and hold a "conversation". Since it is an "intelligent" machine, we do not see any great barriers in the way to producing a computer that understands natural-language in the near future.

I have constructed this description artificially, yet I am sure most of us have heard claims such as this. My point is that the anthropomorphic metaphors lead us easily to an anthropomorphic conclusion--namely, that this "intelligent" computer with an expanded "memory" and more complex capacity for manipulating "symbols", will, someday, "understand" natural language.

Now, let us make the same argument, this time using more impersonal, technical language.

The new computers will have expanded data-storage capacity, and their processors will use more complex codes. New programs

will allow even faster manipulation of digital data configurations. When this new capacity is joined up with sound-pattern analyzers, you will be able to speak in the presence of the computer and, if you say certain key words, the machine will execute certain functions. This will be a more sophisticated data processor.

Now, can this data processor "understand" natural language? I think with this set of terms there is room for some doubt. There is room for discussion here. Is a computer code equivalent to a human "language"? Perhaps not. The terms allow us to make distinctions. Does a "sound-pattern analyzer" actually "recognize" speech? Probably not. Is a "digital data configuration" equivalent to a human "symbol"? Probably not.

This more impersonal, technical language will bias the discussion in another direction--away from the notion that a computer can do just what humans do. There is less temptation to anthropomorphize the computer, and more of an incentive to discuss differences between computers and humans. We should be more willing to accept the fact that we actually do not have an accurate vocabulary to describe what the computer does, and we need to set about inventing new and appropriate terms.

There is a void in our understanding of computers. We do not have a proper language to describe them or their activities. We have tried to fill that void with metaphorical language, which metaphorically extends human functions into the new domain of computer functions. However, this strategy may blind us to the need for new, more accurate terms. And the metaphors which have marked off the unfamiliar territory have taken on the status of new truths, of

"how it is." As a result, when we think we are discussing the potentialities of computers, we are actually just tracing out the implications contained in our choices of metaphor.

This is an important area to be aware of as teachers, and to make students aware of as well. Our metaphors can liberate us and help us think about unfamiliar domains, or they can also imprison us, and keep us from thinking creatively about new alternatives. I am claiming that our anthropomorphic metaphors for computers have become a prison for our discourse, and have guided our thought toward one set of conclusions. We need to realize just how different our minds and computers are.

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